

On the genera *Allomachilis* Silvestri, 1906, and *Kuschelochilis* Wygodzinsky, 1951 (Insecta: Microcoryphia)

Luis Fernandes Mendes⁽¹⁾, Miquel Gaju-Ricart⁽²⁾, Rafael Molero-Baltanás⁽²⁾ y Carmen Bach de Roca⁽³⁾

⁽¹⁾Instituto de Investigação Científica Tropical, Centro de Zoologia, Rua da Junqueira, 14- 1300 Lisboa, Portugal. E-mail: luis.mendes@iict.pt

⁽²⁾Universidad de Córdoba, Departamento de Zoología, Campus de Rabanales C-1, 14071 Córdoba, Spain. E-mail: ba1garim@uco.es, ba1mobar@uco.es ⁽³⁾Universidad Autónoma de Barcelona, Departamento de Biología Animal, Biología Vegetal y Ecología, Unidad de Zoología, 08193 Bellaterra, Barcelona, Spain. E-mail: carmen.bach@uab.cat

Abstract – The objective of this study was to revise the nominal, and only described, species of the genera *Allomachilis* Silvestri, 1906, from Australia, and *Kuschelochilis* Wygodzinsky, 1951, from Chile (Microcoryphia: Meinertellidae). The studied specimens came from the collections deposited in the: American Museum of Natural History (USA); Instituto di Entomologia Agraria dell'Università di Portici (Italy); South Australian Museum (Australia); Carmen Bach collection of the Universidad Autónoma de Barcelona (Spain); and the entomology collection of the Instituto de Investigação Científica Tropical (Portugal). The revision of the nominal species of the genera *Allomachilis* and *Kuschelochilis* allows to consider the Neotropical genus a junior synonym of the Australian one.

Index terms: Australia, Chile, Meinertellidae, new synonymy.

Sobre os gêneros *Allomachilis* Silvestri, 1906 e *Kuschelochilis* Wygodzinsky, 1951 (Insecta: Microcoryphia)

Resumo – O objetivo deste estudo foi revisar as espécies nominais, e somente descritas, do gênero *Allomachilis* Silvestri, 1906, da Austrália, e *Kuschelochilis* Wygodzinsky, 1951, do Chile (Microcoryphia: Meinertellidae). Os espécimens estudados vieram das coleções depositadas no: American Museum of Natural History (EUA); Instituto di Entomologia Agraria dell'Università di Portici (Itália); South Australian Museum (Austrália); Coleção Carmen Bach da Universidad Autónoma de Barcelona (Espanha); e a coleção entomológica do Instituto de Investigação Científica Tropical (Portugal). A revisão das espécies nominais do gênero *Allomachilis* e *Kuschelochilis* permite considerar o gênero Neotropical como sinônimo júnior do gênero Australiano.

Termos para indexação: Austrália, Chile, Meinertellidae, nova sinonímia.

Introduction

The genus *Allomachilis* Silvestri, 1906, is known by only one species from South Australia, *A. froggatti* Silvestri, 1906, whose description was detailed by Womersley (1938, 1939) based on samples from Western Australia, South Australia, New South Wales and Bass Strait Islands. The Neotropical genus *Kuschelochilis* Wygodzinsky, 1951 is also considered monotypic and is not known outside Chile. The only species described, *K. ochagaviae* Wygodzinsky, 1951, was collected in the Juan Fernandez Island of Masatierra, on rosettes of the bromeliad *Ochagavia elegans*, and further data (Wygodzinsky, 1967) indicate the genus is present in San Ambrosio Island and on the coast of mainland Chile.

Taking into account the morphological characteristics commented below, which are the only ones suggested by Wygodzinsky (1951) as differentiating the two genera,

in the absence of further diagnostic features, and after the study of the type-material of both species (and of other taxa from the Australian and Neotropical regions, under description), we propose that *Kuschelochilis* Wygodzinsky, 1951, must be understood, from now on, as a junior synonym of *Allomachilis* Silvestri, 1906, due to the absence of true diagnostic features.

Allomachilis Silvestri, 1906, “sensu novum”, will be re-described based on paratypes and other samples of nondescribed material. These specimens will allow us to present, in the near future, more data on *A. froggatti* and *A. ochagaviae*, which are to date the only two species known in the genus. In addition, these specimens include new species to be described from the Australian and the Neotropical regions. The known recent geographical range indicates a quite primitive genus that should have differentiated before the Gondwanan break-up (i.e. more than 160 million years ago) and seems to reflect a trans-Antarctic passage.

Materials and Methods

We have studied specimens deposited in the: American Museum of Natural History, New York (1 male and 1 female paratypes of the Chilean species); in the Instituto di Entomologia Agraria dell'Università di Portici, in Portici, Italy (1 female paratype from Australia); South Australian Museum, Adelaide, Australia; Carmen Bach collection of the Universidad Autónoma de Barcelona, Spain; and in the entomology collection of the Unit of Zoology in the Instituto de Investigação Científica Tropical (former Centro de Zoologia), Lisbon, Portugal.

The specimens were compared using stereoscopic and optical microscopes; part of them was already mounted in slides and the new dissected specimens were mounted in Tendeiro medium (Molero-Baltanás et al., 2000).

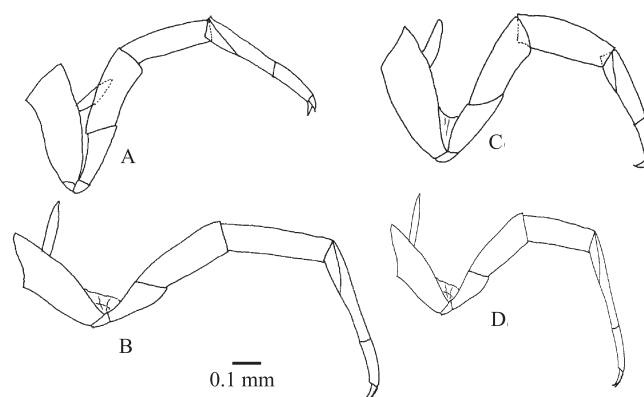
Results and Discussion

The genus *Kuschelochilis* was related to *Allomachilis*, excepting that the latter was "... without stylets on its legs ..." (Wygodzinsky, 1951). Genus *Kuschelochilis* shows, indeed, coxal stylets on P II and P III (Figure 1 A and B), but this characteristic is shared by *Allomachilis* in contrast to that stated by Wygodzinsky (1951) (Figures 1 C and D). Moreover, this characteristic was originally reported by Silvestri (1906) at p. 325: "Pedes ... paris 2i et 3i coxa processu externo styliformi aucto...", later confirmed by Womersley (1939), and illustrated in Figure 1 and in described transcription of the genus.

Wygodzinsky (1951) sustained that "...the most typical character of *Kuschelochilis*, which does not repeat itself in any other genus in the family, is the complete absence of exertile vesicles on the abdominal urosternites ...". However, despite Wygodzinsky's analysis, there are, as a matter of fact, vesicles in the Chilean genus – quite reduced though visible – on abdominal coxites II–IV (Sturm & Bach, 1992) (Figure 2 A–E), as also occurs in *Allomachilis* (Figure 2 F–J). The complete absence of coxal vesicles is currently known in *Machilinus* as well, a genus included in a quite different lineage (Sturm & Bach, 1993; Figure 83, and Sturm & Machida, 2001) that integrates several groups of species with distinct sets of vesicles (from II–VII to none).

The abdominal sternites of *Kuschelochilis ochagaviae* were originally considered as "very tiny", according to what is known as typical to the family, but those in segments II–IV have never been described in a figure. The urosternites II–IV of *Kuschelochilis* are more developed than could be expected in a Meinertellidae (they are, however, progressively smaller), and only the urosternites V–VII are really tiny (Sturm & Bach, 1992, Figure 83 and Figure 2 B and C). A similar development of abdominal sternites II–IV, also clearly bigger than usual in the family, is also observable in *Allomachilis* (Figures 2 G–I, despite never being illustrated in a figure).

Kuschelochilis was originally described further as "... Ovipositor of the female delicate, elongate, of the primary type." However, this same structure was reported and illustrated by Sturm & Bach (1992, Figure 84, 1993) as a true secondary type ovipositor. Indeed, this Figure corresponds to a different species (under description) of the genus collected in the San Ambrosio Island, one of the "Islas de Los Desventurados", also off the Chilean coast. With respect to *A. froggatti*, it was stated that: "... Ovipositores crassiusculi ... setis subtilibus instructi, in exemplo uno ad apicem pro setis spinis brevissimis aucti" (Silvestri, 1906). As a matter of fact, a re-observation of one paratype showed that there are thin fossorial claws in the apical articles of gonapophyses VIII and IX; however, some other samples from different areas of southern Australia present typically primary type ovipositors (further species under description). Described and nondescribed materials from *Allomachilis* and from *Kuschelochilis*



Figures 1. *Allomachilis ochagaviae* Wygodzinsky, 1951, female (A and B): A, profile of P II; B, id. P III. *Allomachilis froggatti* Silvestri, 1906, female (C and D): C, profile of P II; D, id. P III. Scale: 0.1 mm.

showed that both types of ovipositor can be present in both the Australian and the Neotropical species.

Kuschelochilis was finally considered by Wygodzinsky (1951) "... to approach also

Nesomachilis ... on account of the shape and position of its ocelli and the specialized bristles of the male maxillary palp ...", a genus that, though eventually similar and probably part of the same evolutionary lineage, presents nonannulated antennae, a small hook-shaped process, and a spine tuft at the inner apex of the second article of the male maxillary palp, exertile vesicles till coxosternite VII, and a quite distinct penis (Sturm, 1980). This same proximity is applicable to *Allomachilis* (Sturm & Machida, 2001).

Therefore, *Allomachilis* can be characterized as *Allomachilis* Silvestri, 1906, *sensu novum* (= *Kuschelochilis* Wygodzinsky, 1951 n. syn.), and in a redescription of Meinertellidae: is medium to large size; antennae, palps and legs are not scaled, with the scales restricted to the body and terminal filaments. Hypodermal pigment is present, sometimes very dark. Protruded frons, between the paired ocelli. Big compound eyes, as wide as long to slightly wider than long; submedian paired ocelli, subtriangular and close to each other (their distance are usually shorter than their width, sometimes almost inexistent). Antennae longer than body, thin, the distal chains have numerous divisions, each one with a transverse row of setae, some shorter bristles and 1–2 rosette sensilla. Mandibles are thin and elongate, the incisive part have 4 defined teeth, and the molar area is well exposed. Maxillary palp is as usual, in the male with or without specialized setae, though lacking apophysis on the second article; the longitudinal process of base is poorly developed. Typical labium. Labial palp is similar in both sexes, the distal article is thin and elongate; the terminal conules have indentated apex and 1+1 minute setae in the middle area. The legs of male are not modified; P–II and P–III have developed coxal stylets, the legs are with or without ventral spines; tarsi have 3 tarsomera. Urosternites II–IV are triangular and small, but well visible (becoming progressively less developed), and the more posterior ones are quite reduced. Tiny coxal vesicles are restricted to one pair in the coxosternites II–IV. Coxosternites have some thin setae, without spines or spiniform setae. The median posterior area of coxites VII of female are protruded. Stylets have abundant thin setae, those of coxite IX with one inner row of spiniform setae also. The terminal spine of stylets are not especially thin, and are shorter than half the stylet length. It has no paramera. Ovipositor

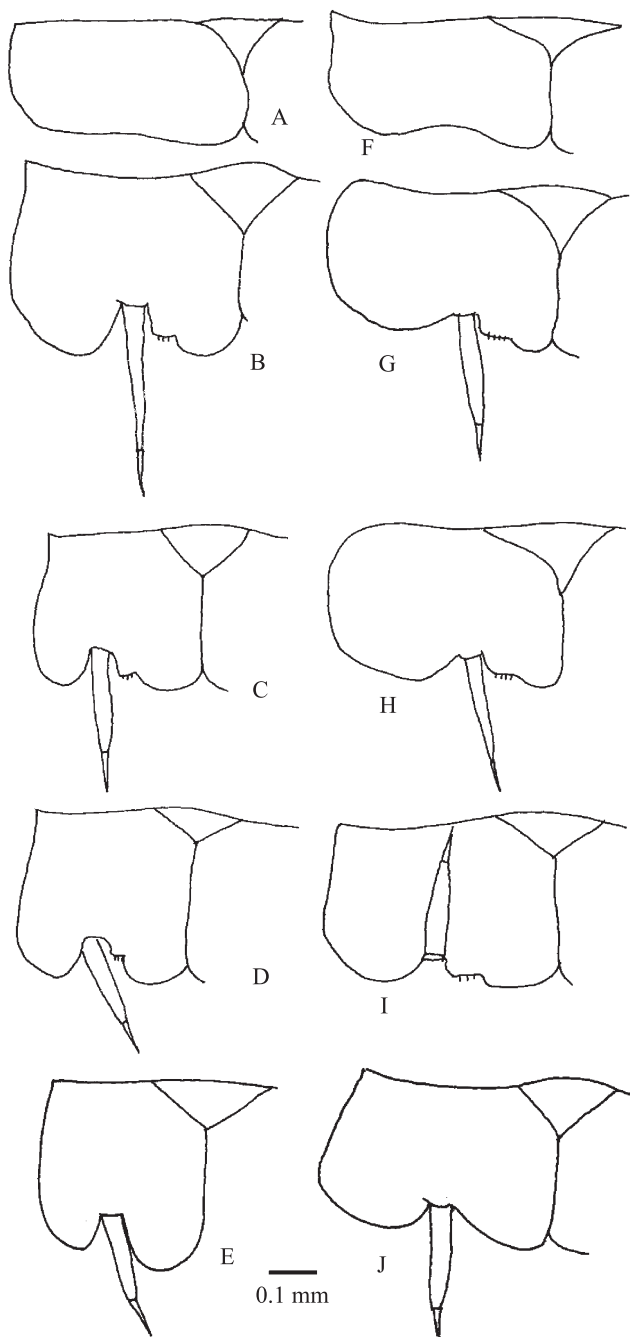


Figure 2. *Allomachilis ochagaviae* Wygodzinsky, 1951, female (A to E): A, coxosternite I; B, id. II; C, id. III; D, id. IV; E, id. V. *Allomachilis froggatti* Silvestri, 1906, female (F to J): F, coxosternite I; G, id. II; H, id. III; I, id. IV; J, id. V. Scale: 0.1 mm.

is of two types, surpassing the level of the stylets IX. Gonapophyses VIII are more robust than the IX, and are parallel-sided, not dilated, with some quite robust apical setae or with apical fossorial claws with terminal divisions with numerous small fossorial conules. The terminal filaments are long, scaly, with some acute spines and setae, lacking hair-like scales.

Allomachilis s.n. is one of the few genera of Meinertellidae in which males lack the inner distal dorsal apophysis, in the second article of the maxillary palp, a characteristic considered (Sturm & Bach, 1993; Sturm & Machida, 2001) as typical to the family and as diagnostic with respect to the Machilidae. That absence seems to be shared by three other genera only, which may be understood (at least partially) as one homoplasy: *Machilellus*, known to occur in southeast Asia and Indonesia (Mendes, 1981) for the description of the male sex; *Madagaschiloides* (Mendes, 1998), a Madagascan endemic; and *Patagoniochiloides* (Mendes, 1998), exclusively from the Argentinean Patagonia. *Allomachilis* s.n. and *Machilellus* present, further, relatively well-developed urosternites II–IV, in contrast to the condition of all the remaining genera of Meinertellidae (*Madagaschiloides* and *Patagoniochiloides* included). We interpret this as one more homoplasy between those two genera, as part of two independent lineages (Sturm & Bach, 1993). This, however, clearly suggest their plesiomorphic condition. As a matter of fact, *Machilellus* was considered as part of the “*Machilontus* group” while *Allomachilis* (and *Kuschelochilis*) was registered as part of the “*Machiloides* group”.

Conclusion

The revision of the nominal, and only described, species of the genera *Allomachilis* from Australia and *Kuschelochilis* from Chile allows to consider the Neotropical genus a junior synonym of the Australian one.

Acknowledgements

To Dr. Christine Johnson and Dr. Randall T. Schuh, from the American Museum of Natural History (AMNH), New York, USA, and to Prof. E. Trembley from the Instituto di Entomologia Agraria dell'Università di

Portici (IEP), Portici, Italy, for the loan of the samples studied; to Dr. Pedro Wygodzinsky, for his kindness in offering to the authors most of his publications and several specimens, including samples of the Chilean “*Kuschelochilis*” from San Ambrosio, deposited in the Carmen Bach collection of the Universidad Autónoma de Barcelona and entomology collection of the Instituto de Investigación Científica Tropical collections.

References

- MENDES, L.F. On the quoted uniformity of *Machiloides* (Microcoryphia: Meinertellidae), with description of two new genera, a new subgenus and one new species. **Garcia de Orta: Serie de Zoología**, v.22, p.45-53, 1998.
- MENDES, L.F. Sur quelques Microcoryphia de l'Asie Orientale: notes et descriptions (Insecta: Apterygota). **Nouvelle Revue d'Entomologie**, v.11, p.15-28, 1981.
- MOLERO-BALTANÁS, R.; GAJU-RICART, M.; BACH DE ROCA, C. On the taxonomic use of the distribution pattern of the antennal asteriform sensilla in *Neoasterolepisma* and *Tricholepisma* (Insecta, Zygentoma, Lepismatidae). **Pedobiologia**, v.44, p.248-256, 2000.
- SILVESTRI, F. Note sui Machilidae. III. Descrizione di un nuovo genere e di sei nuove specie. **Redia (Firenze)**, v.3, p.325-335, 1906.
- STURM, H. Redescription of *Nesomachilis* (Archaeognatha: Meinertellidae) with descriptions of new species from the Australian region. **New Zealand Journal of Zoology**, v.7, p.533-550, 1980.
- STURM, H.; BACH, C. New American Meinertellidae (Archaeognatha, Machiloidea). **Pan-Pacific Entomologist**, v.68, p.174-191, 1992.
- STURM, H.; BACH, C. On the systematics of the Archaeognatha (Insecta). **Entomologia Generalis**, v.18, p.55-90, 1993.
- STURM, H.; MACHIDA, R. **Archaeognatha**. Berlin: Walter de Gruyter, 2001. 213p.
- WOMERSLEY, H. **Primitive insects or Apterygota of South Australia**. Adelaide: Government Printer, 1939. 322p.
- WOMERSLEY, H. Studies on Australian Thysanura. IV. Machilidae (Bristle-tails). **Transactions of the Royal Society of South Australia**, v.62, p.3-8, 1938.
- WYGODZINSKY, P. On the geographical distribution of the South American Microcoryphia and Thysanura (Insecta). In: DEBOUDEVILLE, C.D.; RAPOPORT, E. (Ed.). **Biologie de l'Amérique Australe: études sur la faune du sol: documents biogéographiques**. Paris: Centre National de la Recherche Scientifique, 1967. p.505-524.
- WYGODZINSKY, P. Thysanura from Juan Fernandez Island (Apterygota). **Revista Chilena de Entomología**, v.1, p.199-204, 1951.